ENTOMOLOGY

Project title: **Butterflies of Greater Yellowstone; Aquatic Insects of Greater Yellowstone**

Principal investigator: Dr. Robert Anderson
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Objective: In conjunction with two courses taught for the Yellowstone Institute at Lamar Ranch one week in early July 1999, sample butterflies and aquatic insects in the northern sector of YNP, and from Gardiner, Montana, to Beartooth Summit. Specimens collected from meadows, fields, and ponds and small streams are to be catch and release only.

Findings: Butterflies representing six of the seven families of *Rhopalocera* were identified. These observations included two species of *Papilionidae* (including numerous parnassians), several species of *Pieridae*, *Satyridae*, *Nymphalidae*, *Lycaenidae*, *Hesperiidae* (sixteen species). A special effort was undertaken to identify the Yellowstone Checkerspot butterfly in the northern region, but none were found. Sex ratio information collected for parnassians indicated a predominance of males: 22M/lF.

Samples of aquatic insects collected from various streams and glacial ponds in the northern region were similar in species composition and diversity to collections made in previous years, with approximately eight species of *Trichoptera*, several species of *Plecoptera*, about six species of *Ephemeroptera*, plus varied species of *Odonata* and aquatic diptera. All specimens obtained in the park were released at point-of-capture following in-field discussions.

Project title:	**Mosquito Distribution Correlated with Elevation, Habitat, and Temperature**
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Additional investigators:	Greg Johnson

Objective: The objective of this research is to determine if certain species of *Aedes* mosquitoes are restricted by selected habitat variables, including water temperature and pH, elevation, and habitat (in terms of shading and vegetation). A secondary objective is to determine if the species are associated with each other in any significant ways.

Findings: No additional samples have been taken, although the addition of *Culicoides* (another small dipteran that is frequently found in the mud around the edges of more or less temporary pools) should have resulted in additional materials. At this point, the mosquito data are being analyzed and summarized. Total completion of this project is anticipated during 2000.

Project title:	**Butterflies of Yellowstone and Grand Teton Park (also Odonata)**
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Additional investigators:	Mardell Oleta Moore

Objective: To produce field guides about the insects of Yellowstone and Grand Teton national parks. Photographs need to be taken of all species in the parks. Data & photos only need to be obtained. No specimens are collected. All specimens are safely netted, photographed and released live in the area of the park where they were discovered by the researchers.

Findings: In 1999, 16 slides of dragonflies and damselflies were taken. The species include: four spotted skimmer, mountain emerald, western pondhawk, twelve spotted skimmer, paddle tailed darner,

red skimmer, common whitetail and tule bluet. Copies of all slides taken are donated to the museum located at the Albright Visitor Center in Yellowstone National Park. Our fieldwork in 1999 has led us to believe that one can expect to find from one to a maximum of three different species of dragonflies on each wet area inventoried so far. It will take a lot of fieldwork to cover the numerous wet areas in the park to discover all the possible species present within the park.

Project title: **The Mosquitoes of Yellowstone National Park, A Study of the Species and their Biology**

Principal investigator: Dr. Lewis T. Nielsen
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Objective: A continuing study of the Yellowstone mosquito fauna, species distribution and ecology.

Findings: A visit to the park in 1999 during the month of August resulted in presence of very few adult mosquitoes. However, collections of larvae in July resulted in a new record for the park (*Aedes communis*). Yellowstone now contains 30 species.

Project title: **Assesment of Host Races in the Ovary-Feeding Beetle, *Brachypterolus pulicarius* (Coleoptera: Nitidulidae)**

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Additional investigators: Kelly Hering, Bryan FitzGerald

Objective: This research is being completed for Kelly Hering's master's thesis project at Montana State University, investigating the existence of host races in the beetle, *Brachypterolus pulicarius*, a natural enemy of yellow and Dalmation toadflax. Because this beetle exists on two separate host plants, I am investigating whether the species consists of two genetically distinct host races. In choosing sites to collect the insects and plant material, I sought sites where the insects have never been released as a biological control agent. Rather, they were accidentally introduced along with the weeds. Because *B. pulicarius* has never been introduced into Yellowstone, and because both yellow and D. toadflax infestations are present, the park offers an excellent opportunity for collecting the insects as they naturally occur on the

two hosts. Along with the sites in Yellowstone, others in Canada and the northeastern United States will be analyzed.

Findings: On August 26, 1999, Bryan FitzGerald and Kelly Hering met Craig McClure, a park ranger, to sample several toadflax sites. Insects and plant material were collected at five separate sites, taking a total of about 50 insects and 15 plant stems. Insects from both yellow and Dalmation toadflax were collected, and placed into alcohol to be preserved for use in genetic analysis. All insects collected will be consumed during the course of the genetic research.

In the months since collecting, an extensive literature review and research of various genetic techniques has been conducted. Recently, the lab began utilizing a DNA extraction protocol, the first step of genetic analysis, and has had success with the technique. We intend to use the Amplified Fragment Length Polymorphism (AFLP) technique for genetic analysis of intra-specific variation in the samples.

Project title: **Respiratory Physiology and Habitat Selection in Thermophilic Aquatic Insects**

Principal investigator: Dr. Brent Ybarrondo
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Objective: Understand respiratory physiology and habitat selection decisions in thermophilic aquatic insects, including water scavenger beetles (Coleoptera: Hydrophilidae) and both adult and nymphal stages of dragonflies and damselflies (Odonata). Correlate habitat selection decisions and thermal preference with respiratory physiology and development (Odonata).

Findings: Odonate niads from thermal pools were found to exhibit thermal preference in the laboratory. Hydrophilid respiratory complex (plastron + macroplastron, or bubble) functions primarily as an oxygen reservoir at water temperatures greater than ca. 5° C. Future research will investigate: 1) the degree to which the respiratory complex function as a physical gill at low water temperatures (ca. Tw = 0 to 5.0° C); 2) the degree to which adult male dragonflies exhibit thermal preference in controlling oviposition territories in thermally variable environment (e.g., Firehole Rive study site); and 3) development rates of odonate niads as a function of water temperature and dissolved oxygen tension. Findings to date were presented as an invited speaker at the Entomological Society of America national meeting in December 1999 as part of a symposium entitled: "Life on the Edge: The Physiology, Ecology, and Evolution of Insect Thermoregulation and Temperature Tolerance."